LOG L-2800
SERVICE MANUAL

L & G MODEL L2800 CIRCUIT DESCRIPTION

1. Equalizer Amp. Section

Adopted is an Operational I.C., RAYTHEON RC-4558-DN, which is of 8-pin Dual Inline Package Type. A built-in phase compensation capacitor for high frequency makes it impossible to adjust the value according to R & D purpose. This contributes so much to the various characteristics and sonic quality. Fundamentally, at the negative feedback amplifier, especially the equalizer amplifier, the high frequency phase compensation should be kept in proper condition. When the compensation is too weak, the circuit becomes instable and in many case oscillation is inevitable. In such state, the sonic quality is out of discussion.

On the contrary, the phase compensation is too strong, the distortion at high frequency range is much increased and at the same time it affects sonic quality to a great extent. That is the input impedance is reduced by the high frequency phase compensation (e.g., Mirror Integration), which is indispensable to the multi-stage amplifier, and linearity of the former stage is affected to deteriorate the distortion characteristic. The capacitor inserted between Q6 and Q7 is for high frequency compensation.

To comply with the unique gain distribution of the L2800, we considered a semi-conductor device which offers more inherent gain, comparing with the conventional 3-stage E-E feedback type equalizer. The I.C. offers more than 100dB of inherent gain, and the loop gain at 1KHz is approximately 37dB, which ensures sufficient amount of Negative Feedback at low frequency range. The RC-4558-DN is carefully selected to fulfill no more than 1.5uV Input-Conversion Noise Voltage. Despite that the phase compensation is included, proper compensation is realized as well as the stability, and therefore any type of cartridge can be connected. As for the load condition, the I.C. circuitry exceeds the conventional 3-stage E-E feedback Circuitry.

2. Power Amp Section

Adopted is the fully complementary circuit configuration, which seems to be the most ideal one at present. Signals are supplied from the equalizer amp directly to the power amp section via buffer stage. The rated output of 50W/ch is realized at 190mV of equalizer output voltage (Input Sensitivity 2.8mV). That is the voltage gain is approximate 39dB which is higher by some 6dB than that of standard power amplifiers. And naturally various problems must be considered.

First, referring the harmonic distoriton, especially at high frequency range, it tends to be worse. In actual, distortion at 10KHz is twice as bad as that of the amplifier having some 33dB voltage gain. This is of course in the case of using the same semi-conductior device.

To compensate the lost gain caused by applying Negative Feedback, it is necessary to increase the inherent gain by delving into the inherent characteristics. At the first differential input stage, it is of utmost necessity to reduce the DC offset voltage at the output terminal, and of high hfe at the operational current area. For the L2800, adopted is the one of 3dB allowance between minimum and maximum. The standard hfe value is 500, which is very high. Also at this stage a zener diode is arranged to deal with the mains power fluctuation.

Second Differential Amp. Stage.

This stage palys an important role to decide distortion ratio, especially at high frequency range. Fundamentally transistors of high f_T and low Cob are necessary, and high load impedance should be realized since the stage makes most of the voltage gain. Therefore inherent gain is obtained sufficiently up to high frequency range thanks to constant current drive.

The f_T of the transistors is over 130MHz (Ic = 10mA), and the Cob is less than 2pF, which is far above the audio frequency band, nevertheless from the view point of fae, the fea is 75KHz in case hfe is determined as 200. Thus such high frequency characteristic is indispensable.

Also at the driver stage and the power stage, transistors of high f_T are necessary when good high frequency characteristic is required, but there exists close relation between f_T and breakdown of transistors: When f_T is extended, high frequency becomes unstable, and power transistors are easily damaged due to oscillation etc. And recently, this is solved by increasing VCE (sat.), the saturation voltage between collector and emitter, which deteriorates voltage utilization ratio as well as linearity of hfe at the time of huge current driving.

The power transistors adopted in the L2800 realized excellent reliability against breaddown by using larger scale pellet than that of the conventional transistors. Adopting larger scale pellet in the power transistors, the L2800 realized excellent reliability against breakdown without deteriorating high frequency characteristic. Of course the linearity of hfe is excellent.

Thus delving into the semi-conductor device, we increased the loop gain, and the high frequency characteristic is far much improved. This is because the high frequency compensation could be slighter based on the betterment of the inherent characteristics.

3. Tone Control Section

Adopted is the NF type with turnover frequency selector of two steps both for bass and treble respectively.

Bass Turnover Frequency:	150Hz,	300Hz
Treble Turnover Frequency:	3KHz,	6KHz

4. Delay Time Muting Section

In the amplifier of Direct-Coupled configuration, the speaker loads are directly connected to the power transistors, therefore it may be possible to damage the speaker systems in case DC potential appears at the output terminal. Also a slight DC potential gives some bias to the speakers, which affects the sonic quality. Thus the protection circuit is indispensable to eliminate these situation. For the L2800, the Delay Time Muting Circuit operates as a protection circuit at the same time. Therefore the amplifier is muted 5 - 10 seconds at the time of turning the power switch on.

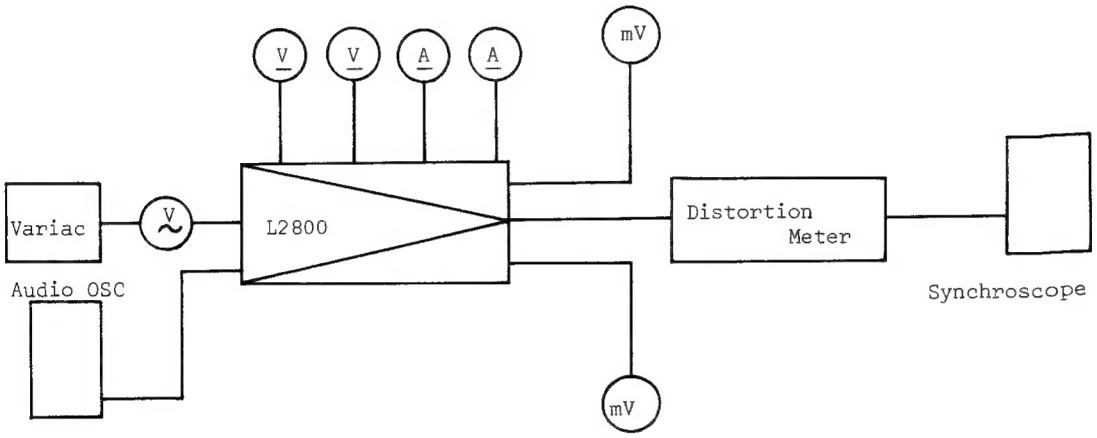
5. Peak Indicator Circuit (PB-1067)

The output signal meets the Peak Detection circuit composed of Q801, Q802, D802 and C802, whose detected DC signal is then converted into low-impedance by current booster Q803 and Q804.

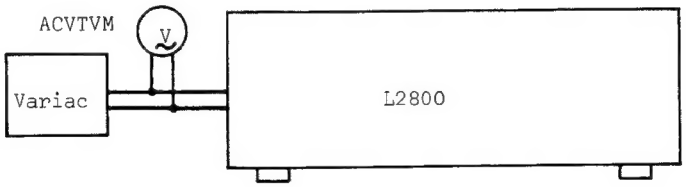
Of course different threshold level is arranged for each L.E.D. driver Q505 - Q510 to make them light up in accordance with the signal level.

Measurement Instruments & Tools

1) AC Voltmeter (ACVTVM)
2) Milivoltmeter
3) DC Ammeter
4) DC Voltmeter (DCVTVM)
5) Audio Oscillator (AFO)
6) Distortion Meter
7) Synchroscope
8) 8-ohm Non-Induction Resistor
9) Frequency Counter
10) Small ⊖ driver
11) Short Pin-Plug
12) Variac



Voltage Check & Delay Time Muting

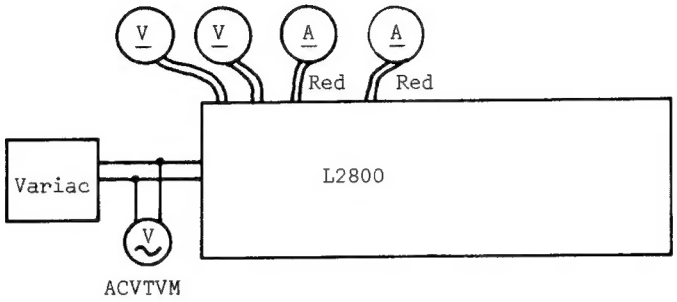


1. Connect a Variac to the amplifier.
2. Adjust the Variac to obtain "0 V" reading.
3. Confirm the 5A fuse is inserted in the fuse holder placed between the power transformer and the back panel.
4. Set the power switch to "ON".
5. Gradually increase the voltage of the variac, confirming there is no trouble, until the precise AC mains voltage is obtained.
   Also note that the pilot lamp lights up.
6. Check the voltage at each terminal on PB-891.

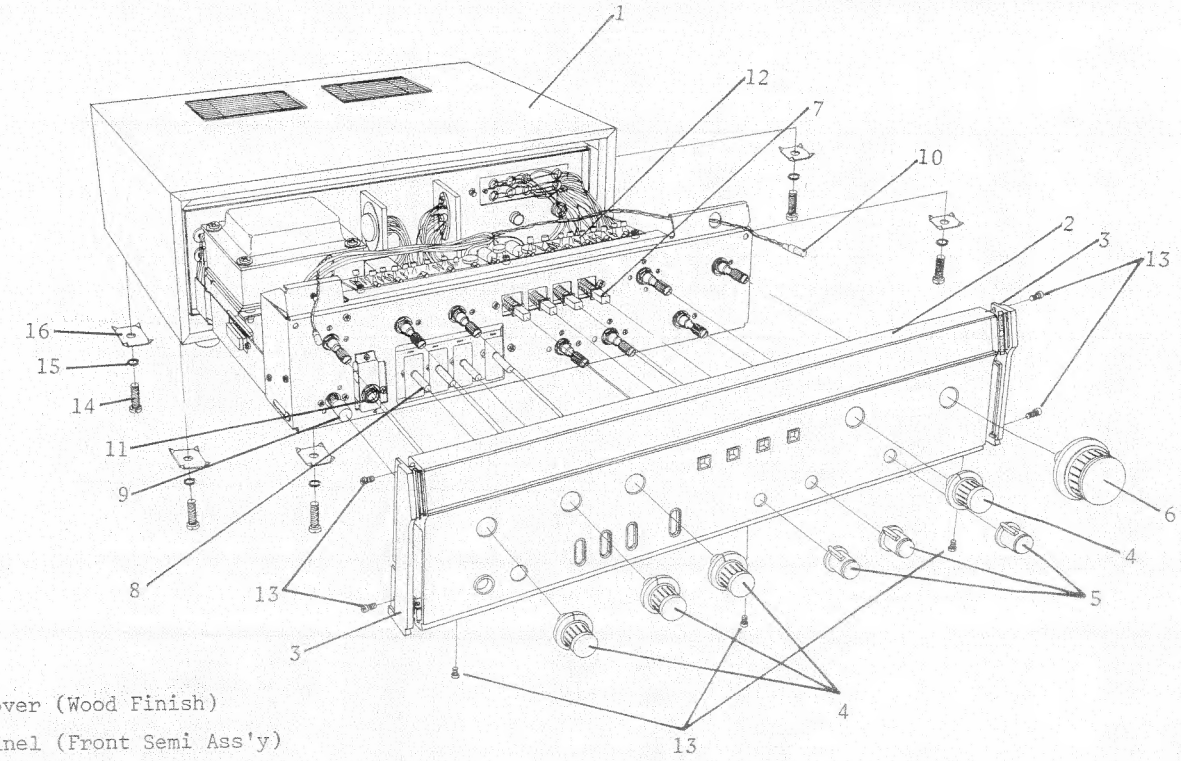
P-107	DC ⊕	around 40V against chassis
P-108	⊖	" 40V "
P-709	⊕	" 20V "
P-203	⊕	" 15V "
P-204	⊖	" 15V "

7. Check precise AC mains voltage is available at the two AC outlets on the back panel.
8. Shut off the power switch.
9. Check precise AC line voltage is available only at the extra AC outlet (UN SWITCHED).
10. Set the power switch to "ON" again to check the operation of the delay time muting circuit. Muting time: 6 secs (+4, -1).

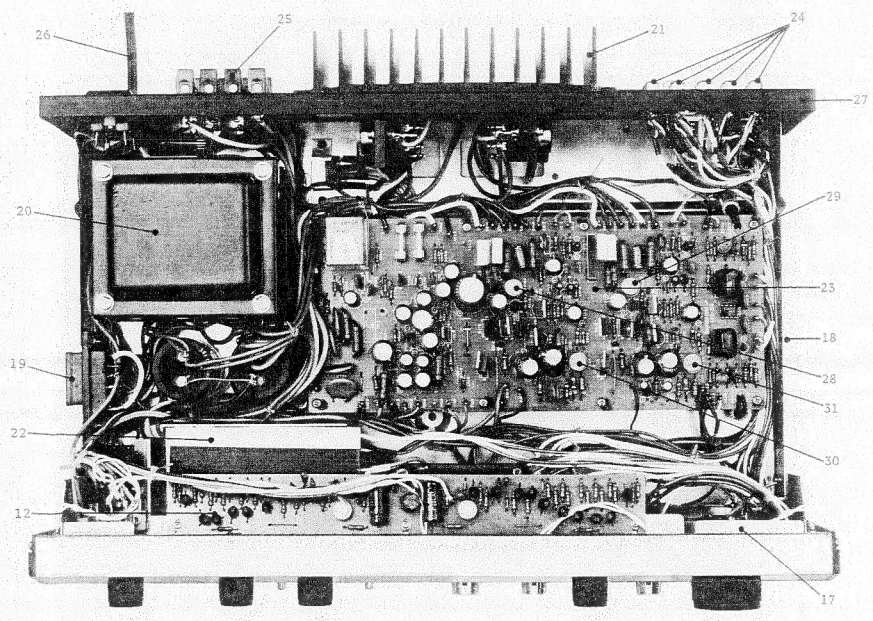
IDLE ADJUST & ZERO DC OFFSET



1. Set the power switch to "OFF".
2. Set both of the VR101 (for Idle Adjust) on PB-891 to the extreme counter-clockwise position.
3. Set both of the VR102 (for Zero DC offset) at the mechanical center position.
4. Remove the Red lead wire from the heatsink. Connect the DC ammeter (100mA); ⊕ to the lead wire and ⊖ to the socket on the heatsink.
5. Connect the DC voltmeter (less than 1V at full scale) to the speaker terminals to measure DC offset. The speaker switch should be at the "main & remote" position.
6. Press the power switch to "ON"
7. After one minute, adjust VR-101 to obtain 30mA reading on the DC ammeter. (This should be applied on both channels.)
8. Adjust VR-102 to obtain 0 DC offset. (This should also be applied on both channels.)
9. Power switch to OFF.
10. All the wiring should be reset as they were.



1. Cover (Wood Finish)
2. Panel (Front Semi Ass'y)
3. Side Plate
4. Knob (Function, Treble, Bass, SP Selector)
5. Knob (Balance, Monitor, Dubbing)
6. Main Volume Knob
7. Push SW. Knob
8. Lever SW. Knob
9. Power SW. Knob
10. Edge Lamp
11. Headphone Jack
12. L.E.D. PCB Ass'y
13. Screw 3mmø x 6
14. Screw 4mmø x 20
15. Spring Washer 4mmø
16. Square Washer (with Toothed Lock)



17. Sub Panel
18. Main Chasses Complete Ass'y
19. Voltage Selector (100-120-220-240V)
20. Power Transformer
21. Power Amp. Complete Ass'y
22. Shield Plate
23. PB-891 (Pre, Main P.C.B.)
24. Pin Jack Ass'y
25. Speaker Terminal
26. Main Cord
27. Back Panel
28. VR102 (0 DC offset-Lch)
29. VR102 (0 DC offset-Rch)
30. VR101 (Idling-Lch)
31. VR101 (Idling-Rch)

L2800 REPLACEMENT PARTS LIST

PB-891

SECTION A

R201	120K	R207	1K	R104	47
202	3.3K	208	680	105	6.8K 1/2W
203	390K	209	220K	106	6.8K 1/2W
204	620	R101	1M	107	47K
205	39K	102	4.7K	R110	8.2K
206	560K	103	47	R115	470

C201	2.2uF	16V	tantalum	C101	10uF 16V tantalum
202	22uF	16V	electrolytic	102	0.0022uF ceramic
205	0.47uF	50V	mylar	103	100uF 16V electrolytic
206	0.047uF	50V	ceramic		
207	0.047uF	50V	ceramic		

Q201	IC	RE4558	VR101	4.7K-B semi-fixed pot.
101	TR	2SA750	D101	WZ120

SECTION B

R108	3.3K	R115	1.5K 1/2W	R122	100 1/2W
109	3.3K	R117	33K 1/2W	123	0.33 cement MPC 71
R101	180	118	22	124	0.33 " "
112	68 1/2W	119	3.9K	125	22 1/2W J metal
113	47K	120	1.2K	126	47 1W J "
114	430	121	100 1/2W		

C104	100uF	50V	electrolytic	C110	0.023uF 50V mylar
105	47pF		ceramic	111	470uF 6.3V electrolytic
106	47pF		ceramic	112	1uF 50V electrolytic
107	100uF	16V	electrolytic	C114	1uF 50V electrolytic
108	100uF	50V	electrolytic	C116	0.1uF mylar
109	0.0015uF		ceramic		

Q102	2SA750	Q106	2SC945	D102	VD1221
103	2SC1507	106	2SB536	103	VD1221
104	2SC1507	108	2SD381	VR102	4.7K-B
105	2SC945			L101	2uH L02

SECTION C

R101	1M	R110	8.2K	R119	3.9K
102	4.7K	111	180K	120	180
103	47	112	68 1/2W	121	100 1/2W
104	47	113	47K	122	100 1/2W
105	6.8K 1/2W	114	430	123	0.33 cement MPC 71
106	6.8K 1/2W	115	470	124	0.33 " "
107	47K	115	1.5K 1/2W	125	22 1/2W J metal
108	3.3K	R117	33K 1/2W	126	47 1W J metal
109	3.3K	118	22		

C101	10uF	16V	tantalum	C109	0.0015uF ceramic
102	0.0022uF		ceramic	110	0.0022uF 50V mylar
103	100uF	16V	electrolytic	111	470uF 6.3V electrolytic
104	100uF	50V	electrolytic	113	0.047uF YZ ceramic
105	47pF		ceramic	115	0.047uF YZ ceramic
106	47pF		ceramic	116	0.1uF K mylar
107	100uF	16V	electrolytic		
108	100uF	50V	electrolytic		

Q101	2SA750	D101	WZ120	VR101	4.7K-B
102	2SA750	102	VD1221	102	4.7K-B
103	2SC1507	103	VD1221	L101	2uH L02
104	2SC1507				
105	2SC945				
106	2SC945				

SECTION D

R606	3.9K		R703	27K		R707	1.8K	1/2W	
607	2.7K		705	1.2K	1/2W	709	4.7K	1/2W J	metalized

C602	220uF	10V	electrolytic	C710	100uF	35V	electrolytic
603	220uF	10V	electrolytic	711	47uF	25V	electrolytic
604	220uF	10V	electrolytic	712	47uF	25V	electrolytic
C705	220uF	35V	electrolytic	713	100uF	25V	electrolytic
C707	100pF		ceramic	714	100uF	25V	electrolytic
708	100pF		ceramic	715	2200uF	16V	electrolytic
709	100uF	35V	electrolytic				

Q107	2SB536	Q604	2SC945	Q702	2SB605
108	2SD381	605	2SC945	D707	1N4002
603	2SA733	701	2SD571		

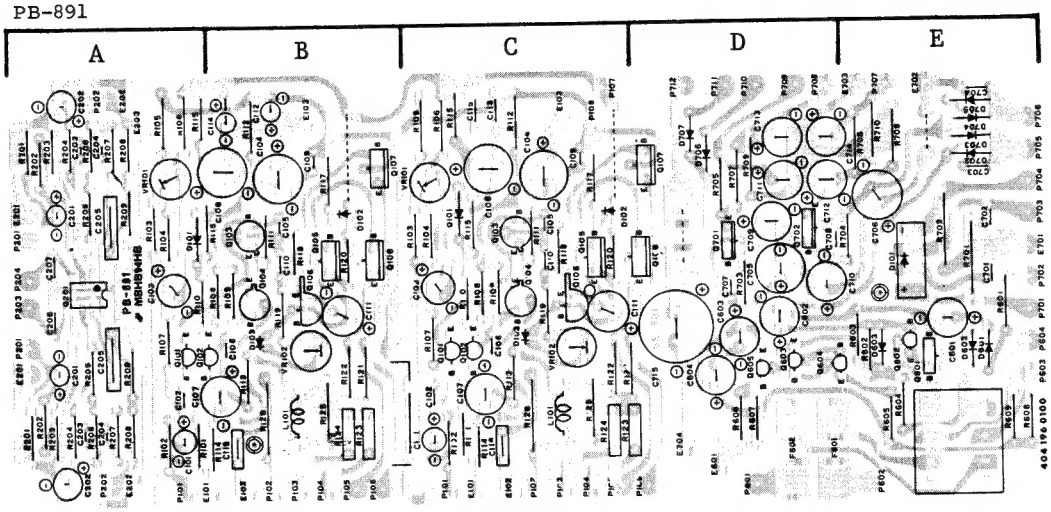
SECTION E

R601	100 1/2W	R608	18K	R706	3.3K	1/2W
602	56K	609	18K	708	1.8K	1/2W
603	1K	701	4.7K 3W J metalized	710	4.7K	1/2W metalized
604	10K	702	4.7K 3W J metalized			
605	10K	704	27K			

C601	22uF	50V	electrolytic	C703	0.01uF	250V	ceramic
701	0.01uF	250V	ceramic	704	0.01uF	250V	ceramic
702	0.01uF	250V	ceramic	706	220uF	35V	electrolytic

D601	1N4002	D702	1N4002	D705	1N4002
602	1N4002	703	1N4002	Q601	2SD571
603	1S1555	704	1N4002	602	2SC945

PB-891



FILTER SWITCH PCB

Resistor	3.3K 2 pcs 12K 2 pcs	Capacitor	0.082uF K mylar 1 pc 0.15uF K mylar 2 pcs 0.033uF K mylar 2 pcs 0.0047uF K mylar 2 pcs
Push Switch	SPZ 045A01		

LEVER SWITCH PCB

Lever Switch	SLA32204 3 pcs SLA32205 1 pc	Resistor	3.3K 2 pcs 1M 4 pcs

TONE CONTROL PCB

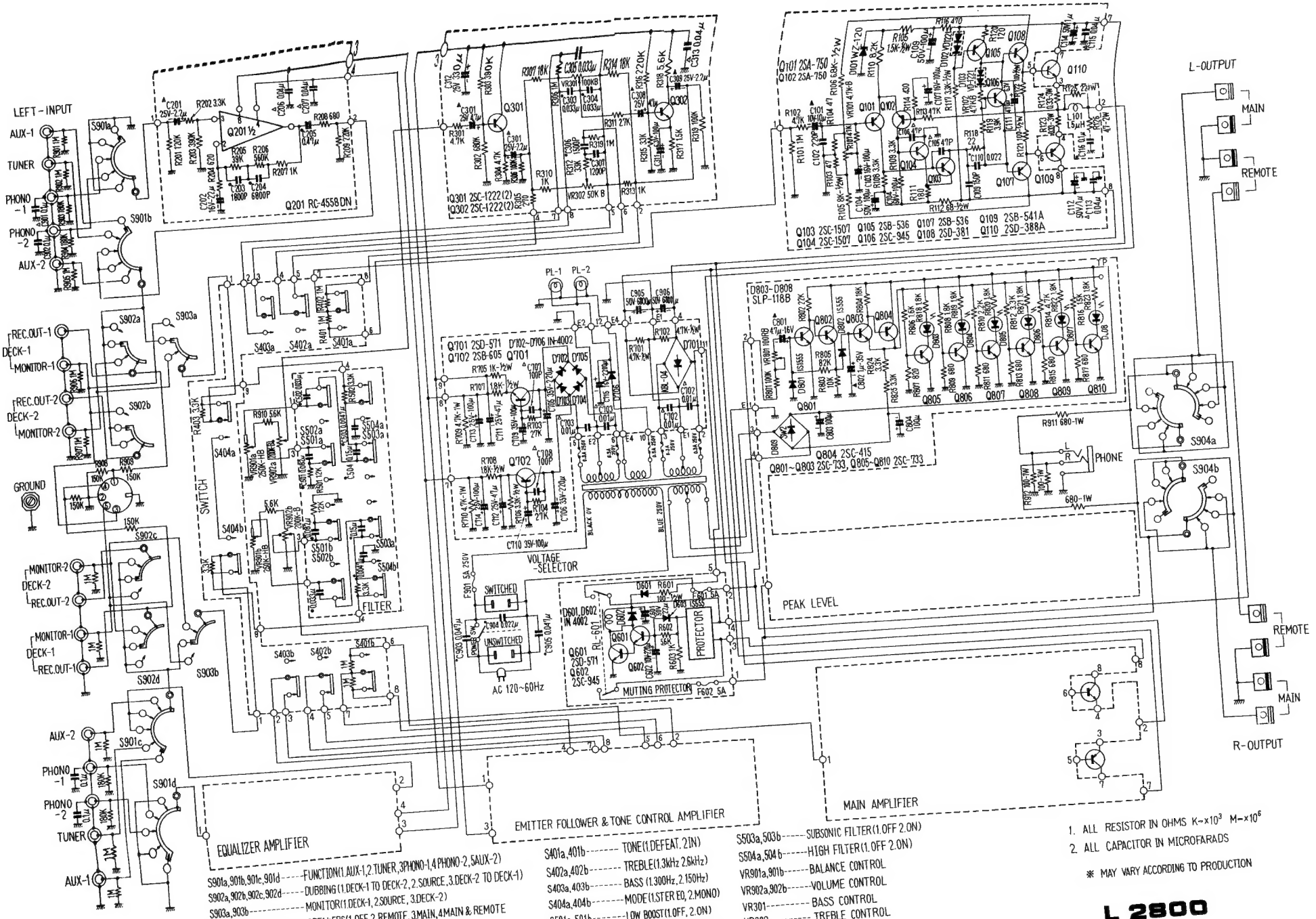
Resistor	100K 4 pcs 1.5K 2 5.6K 2 4.7K 4 390K 2 1K 4 220K 2 270 2	Resistor	680K 1 pc 3.3K 2 1M 4 18K 4 2.7K 2 68K 1 10K 1 33K 1
Capacitor	2.2uF 25V tantalum 4 pcs 4.7uF 25V tantalum 4 100uF 6.3V electrolytic 2 330uF 25V electrolytic 1	Capacitor	0.012uF mylar 2 pcs 0.015uF mylar 2 0.33 mylar 6 0.47uF ceramic 1 YZ
Transistor	2SC1222 4 pcs		

PEAK INDICATOR PCB

R801	100K 2 pcs	R810	2.2K 2 pcs	R819	1.8K 2 pcs
802	22K 2	811	680 2	820	1.8K 2
803	10K 2	812	3.3K 2	821	1.8K 2
804	180K 2	813	680 2	822	1.8K 2
805	82K 2	814	4.7K 2	823	1.8K 2
806	1.5K 2	815	680 2	824	3.3K 2
807	820 2	816	15K 2	825	3.3K 2
808	1.8K 2	817	680 2		
809	680 2	818	1.8K 2		

Q801 - Q803	2SC733 6 pcs	C801	4.7uF 100V tantalum 2 pcs
Q804	2SA495 2	802	1uF 35V tantalum 2
Q805 - Q810	2SC733 12	803	100uF 35V electrolytic 1
		804	100uF 35V electrolytic 1

D809	WO2 7532 1 pc	VR801	semifixed pot 100K-B 2 pcs
801	1S1555 2 pcs		
802	1S1555 2 pcs		
803-8	L.E.D. 12 pcs		


LEFT-INPUT
AUX-1
TUNER
PHONO -1
PHONO -2
AUX-2
GROUND
REC.OUT-1
DECK-1
MONITOR-1
REC.OUT-2
DECK-2
MONITOR-2
SWITCH
FILTER
Q201 RC-4558DN
Q301 2SC-1222(2)
Q302 2SC-1222(2)
Q101 2SA-750
Q102 2SA-750
Q103 2SC-1507
Q104 2SC-1507
Q105 2SB-536
Q106 2SC-945
Q107 2SB-536
Q108 2SD-381
Q109 2SB-541A
Q110 2SD-388A
Q701 2SD-571
Q702 2SB-605
D702~D706 IN-4002
D803~D808 SLP-118B
Q801~Q803 2SC-733, Q805~Q810 2SC-733
Q804 2SC-415
L-OUTPUT
MAIN
REMOTE
PHONE
R-OUTPUT
PL-1
PL-2
VOLTAGE -SELECTOR
AC 120~60Hz
SWITCHED
UNSWITCHED
PEAK LEVEL
PROTECTOR
MUTING PROTECTOR
EQUALIZER AMPLIFIER
EMITTER FOLLOWER & TONE CONTROL AMPLIFIER
MAIN AMPLIFIER
S901a,901b,901c,901d-----FUNCTION(1.AUX-1,2.TUNER,3PHONO-1,4.PHONO-2,5AUX-2)
S902a,902b,902c,902d-----DUBBING (1.DECK-1 TO DECK-2, 2.SOURCE, 3.DECK-2 TO DECK-1)
S903a,903b----------MONITOR(1.DECK-1, 2.SOURCE, 3.DECK-2)
S904a,904b----------SPEAKERS(1.OFF 2.REMOTE, 3.MAIN, 4.MAIN & REMOTE
S401a,401b-------TONE(1.DEFEAT, 2.IN)
S402a,402b-------TREBLE(1.3kHz 2.6kHz)
S403a,403b-------BASS (1.300Hz, 2.150Hz)
S404a,404b-------MODE(1.STEREO, 2.MONO)
S501a,501b-------LOW BOOST(1.OFF, 2.ON)
S502a,502b-------LOW FILTER(1.OFF 2.ON)
S503a,503b-----SUBSONIC FILTER(1.OFF 2.ON)
S504a,504b-----HIGH FILTER(1.OFF 2.ON)
VR901a,901b-----BALANCE CONTROL
VR902a,902b-----VOLUME CONTROL
VR301---------BASS CONTROL
VR302---------TREBLE CONTROL
1. ALL RESISTOR IN OHMS K-×10³ M-×10⁶
2. ALL CAPACITOR IN MICROFARADS
※ MAY VARY ACCORDING TO PRODUCTION
L 2800